

## CLAIMS

1. A slip ring assembly, comprising:
  - a plurality of contact rings;
  - means for supporting the contact rings in spaced relation about a common axis;
  - a housing located adjacent the contact rings and configured to permit relative rotation between the contact rings and the housing about the common axis;
  - means mounted to the housing for supporting a circuit;
  - a plurality of contact brushes each having a proximal end connected to the circuit supporting means and a distal end slidably engaged with a corresponding one of the contact rings;
  - and
  - a position encoder having a signal generating portion mounted on the circuit supporting means and a reference portion mounted on the contact ring supporting means.
2. The slip ring assembly of Claim 1 wherein the housing includes a pair of shells that enclose the contact rings and reference portion of the position encoder.
3. The slip ring assembly of Claim 1 wherein the circuit supporting means includes at least one printed circuit board.
4. The slip ring assembly of Claim 1 wherein the contact brushes apply a spring force to their corresponding contact rings.
5. The slip ring assembly of Claim 1 wherein the signal generating portion of the position encoder is a Hall effect sensor mounted on the circuit supporting means and the reference portion of the position encoder is a magnetic ring with a plurality of separate circumferentially spaced magnetic domain regions.
6. The slip ring assembly of Claim 1 wherein a portion of an electrical connector is mounted on

the circuit supporting means.

7. The slip ring assembly of Claim 1 wherein the contact ring supporting means includes a generally cylindrical body.

8. The slip ring assembly of Claim 1 wherein each of the contact rings has an electrical contact clip connected thereto.

9. The slip ring assembly of Claim 1 wherein the distal end of each contact brush rides in a groove formed in the outer perimeter of the corresponding contact ring.

10. The slip ring assembly of Claim 1 and further comprising a plurality of ring spacers carried on the contact ring supporting means on opposite sides of the contact rings.

11. A slip ring assembly, comprising:

- a plurality of contact rings;

- means for supporting the contact rings in spaced relation about a common axis;

- a housing located adjacent the contact rings and configured to permit relative rotation between the contact rings and the housing;

- a printed circuit boards mounted to the housing; and

- a plurality of contact brushes each having a proximal end connected to the printed circuit board and a distal end slidably engaged with a corresponding one of the contact rings.

12. The slip ring assembly of Claim 11 and further comprising a position encoder having a signal generating portion mounted on the printed circuit board and a reference portion mounted on the contact ring supporting means.

13. The slip ring assembly of Claim 11 wherein the housing includes a pair of shells that enclose the contact rings and reference portion of the position encoder.

14. The slip ring assembly of Claim 11 wherein the contact brushes apply a spring force to their corresponding contact rings.
15. The slip ring assembly of Claim 11 wherein the signal generating portion of the position encoder is a Hall effect sensor mounted on the printed circuit board and the reference portion of the position encoder is a magnetic ring with a plurality of separate circumferentially spaced magnetic domain regions.
16. The slip ring assembly of Claim 11 wherein a portion of an electrical connector is mounted on the printed circuit board.
17. The slip ring assembly of Claim 11 wherein the contact ring supporting means includes a generally cylindrical body.
18. The slip ring assembly of Claim 11 wherein the distal end of each contact brush rides in a groove formed in the outer perimeter of the corresponding contact ring.
19. The slip ring assembly of Claim 11 and further comprising a plurality of ring spacers carried on the contact ring supporting means on opposite sides of the contact rings.
20. A slip ring assembly, comprising:
  - a cylindrical slip ring body;
  - a plurality of contact rings supported on the slip ring body in spaced relation about an axis of the slip ring body;
  - a plurality of ring spacers supported on the slip ring body on opposite sides of the contact rings;
  - a housing located adjacent the contact rings and configured to permit relative rotation between the contact rings and the housing;
  - a printed circuit boards mounted to the housing;

a plurality of contact brushes each having a proximal end connected to the printed circuit board and a distal end slidably engaged with a corresponding one of the contact rings, the contact brushes applying a spring force to their corresponding contact rings;

a position encoder having a signal generating portion mounted on the printed circuit board and a reference portion mounted on the slip ring body; and

a portion of an electrical connector mounted on the printed circuit board.